ether can be determined. An average of 14% per volume is required to maintain anesthesia.

The air is supplied either from an electric pump, a compressed air tank or a foot bellows.

This apparatus has been used repeatedly for intratracheal anesthesia and has served its purpose most admirably.

VACCINATION AGAINST TUBERCULOSIS WITH VON RUCK VACCINE.*

By FRANK NEALL ROBINSON, M. D., Monrovia.

For a number of years Dr. Karl von Ruck of Asheville, N. C., has been working along the line of immunization in tuberculosis. Ever since the introduction of the watery extract of tubercle bacilli (1897) his whole endeavor has been to improve this product, and to this end his studies have been in experimentation with the several component parts of the tubercle bacilli, and their action on the immunizing mechanism. When Bordet and Gengou first published their experiments in "Complement Fixation" he was among the first in this country to see the possibilities of it, and began experimenting with it in his work in his research laboratory.

About a year ago (May, 1912) he gave to the profession the first published account of the "vaccine" and the full detail of his experimental work to prove that this product would stimulate the organism to the formation of antibodies against tubercle bacilli infection, and showed that the serum from the patient immunized would dissolve virulent living tubercle bacilli outside the body. He also showed by the "complement fixation" test that, after an injection of the vaccine, "fixation" would take place in about five days.

The precipitins and agglutins were also increased at the same time as the bacteriolytic power of the serum. Those of you who are not familiar with Dr. von Ruck's work should write him for his reprints covering these experiments, as time precludes the possibility of my incorporating the immense amount of work in a paper of this character, whose scope is purely of a clinical nature.

These experiments prove the value from a laboratory standpoint of this preparation, but to substantiate these laboratory experiments on animals he vaccinated a large series of human beings (over 400), all of whom showed, following the injection, an increase in antibodies, with improvement to the point of "clinical cure" of their tuberculous condition. Up to this time the product had been used for vaccination only, that is, in cases of non-tuberculous, who were exposed to infection, such as children, and older ones in contact with active tuberculous, as well as in cases of glandular, bone before secondary infections, and latent pulmonary lesions; recently he has recommended it in cases where, while active, secondary infection has not taken place, as in pulmonary and glandular, and in bone lesions, especially where no sequestra are present or secondary infection with pus organism has not taken place—as a method of treatment.

These later cases for treatment must be picked with caution, and it will be here where we will find we are more in doubt as to the method to pursue, for it is hard in many of these cases (see case 13, quoted later) to pick those for "treatment dose" and those for "vaccination dose."

With the introduction of this product, I immediately began its use, and will report tonight on a series of about thirty cases, which I have vaccinated during this period, with the findings on examination, the reaction, dosage, and results obtained. I have furnished to several of my colleagues the vaccine for use in their practice, and I hope they will favor me with a brief outline of the results they have been able to obtain, so that I may incorporate their results with mine, to swell the list, to the end that we may learn its usefulness clinically.

In one of the last communications I received from Dr. von Ruck he informs me that after September 15th, 1913, the vaccine will contain but .5% of protein and the necessary amount of fat, while formerly 1% was incorporated in the product, but he finds precipitation takes place in the 1% solution, so that hereafter the dose of the vaccine will be twice as much as before the above date.

The following cases will serve to illustrate the value of the vaccine as an active immunizer in later lesions and in the apparent non-tuberculous:

Case No. 1. Miss D., age 8.—Had pneumonia, followed by right-sided empyemia, which was operated and case drained and healed, but ran persistent temperature of one to one and a half degrees; case referred to me by Dr. Townsend of Long Beach.

Examined lungs, showed no apparent change of breath sounds of a tuberculous nature, but an area of dullness to the right of the mediastinum and a positive tuberculin reaction led me to believe we had an infection of the mediastinal lymph glands.

Treatment: Vaccinated with .3 cc. of vaccine, marked reaction, temperature 101°. Area quite red and infiltrated for three days. Temperature receded to normal in one week, and has remained normal to date. Child gained 5 lbs. the first month.

Conclusion: Examination at end of thirty days showed smaller area of dullness to right of mediastinum. Four months after dose of vaccine area could not be found.

Case No. 2. Mrs. D. (mother of child). No history of any infection. No evidence of any lesion in lung. Complained of tiring with slight overwork.

This dose was given simply because she asked for it as a precautionary measure. No tuberculin test was made, as it was not demed necessary.

Treatment: Vaccinated with .4 cc. vaccine. A very severe reaction took place in 6 hours, with headache, backache, limbache, temperature 102°, arm red and infiltrated. She was ordered to bed, where she remained for 48 hours, when reaction began to subside, temperature began to fall on the third day and by the fifth day was back to normal. She had a sore arm for eight days.

Conclusions: Patient gained 4 lbs. the first month, and when last seen, four months after vaccination, was in good health and had gained in all 10 lbs., weighing more than she had ever weighed in her life, and felt better than for years. This case emphasizes the latent case.

Case No. 3. Mr. D. (father of child).—Had never been strong all his life, took cold frequently. Had

* Read before the Foothill Medical Society, October 13, 1913.

had to leave position nine years ago and go to Sierra Madre for a winter, owing to a dry cough which had persisted for months, since which time has been in apparent good health.

Examination showed old scar (diagnosed as such) at apex of right side, no activity. Temperature normal.

Treatment: Vaccinated with .3 cc. vaccine. Reaction within 6 hours. Temperature 101½°. Backache, headache, sore arm. Had to remain in bed for 24 hours. All symptoms of reaction disappeared in three days, except arm, which remained sore and red for one week, gradually fading away.

This case was not seen again for four months, patient had gained 12 lbs., and says he has not felt as well since he was 16 years old.

Case No. 4. Mrs. N. (nurse).—Has been constantly with tuberculous patient for three years. Complained of tiring easily, but no cough. Has been losing weight lately and running slight (99 2-5° to 99 4-5°) temperature in afternoon. Has been frequently (pulmonary) examined, and told was not tuberculous. Tuberculin reaction positive.

Treatment: Vaccination with .3 cc. vaccine. Reaction not severe, came in about 12 hours, headache and body ache. Temperature reached 100° as the highest in 24 hours and then fell to normal in the next 24 hours, and has been normal since. Arm sore (red and swollen) for a week, and painful to touch.

The fatigue in the afternoon remained with the case for about thirty days, notwithstanding she carried no temperature, when it disappeared and she has been perfectly well to date.

Case No. 5. D. R., age 12.—Mother tuberculous and uncle, who lived with family for a number of years, was tuberculous, but came south and received an "apparent cure." Cervical glands enlarged. Tired easily on exercise, would have afternoon temperature of 99 2-5° to 99 4-5°, very nervous. Took cold very easily.

Treatment: Vaccinated with .2 cc. vaccine at 4 P. M. Severe reaction. Temperature 102° to 103°. Arm very sore. Could not dress, so remained in bed for two days. Third day temperature gradually subsided, until on fifth day following injection, temperature was normal. This boy improved, gained weight, and the tendency to colds left; glands had entirely disappeared in three months. Tire left.

Case No. 6. Mrs. H. G. R., age 38, mother of two children—Never been well since birth of second child (five years). Tired easily. Could not gain weight, appetite poor. Fall colds accompanied by cough. Nervous.

Examination: Changed breath sounds, right upper lobe. Temperature 99 2-5° to 100° on fatigue. Tuberculin test positive.

Treatment: Vaccinated with .3 cc. vaccine at 10 A. M. By bedtime severe reaction, with arm swollen and painful. Temperature reached 101 2-5° by 4 P. M. that day. Restless all night, and the following day had to remain in bed. Temperature gradually fell to normal by fifth day. Arm still remained swollen and sore for a week. Three months afterwards had gained 5 lbs., feeling strong, and has had no temperature since the fifth day following vaccination.

Case No. 7. Miss E., age 23.—Brother in terminal stage of tuberculosis. Temperature 99° to 99 3-5° in afternoon, tired easily, slight cough.

Examination: Changed breath sounds, upper left lobe. Tuberculin test positive.

Treatment: Vaccinated with .3 cc. vaccine at 11 A. M. Slight reaction. Arm sore and red. Temperature 100° by 8 P. M. Reaction passed off in 36 hours and temperature normal at the end of second day. Cough had disappeared by end of first month. Gained in weight 4 lbs. first month. The girl was quite neurasthenic, but by end of third month most of these symptoms had disappeared, excepting girdling headache.

Case No. 8. A. S., age 6.—Mother died with pulmonary and laryngeal tuberculosis. No enlarged glands. No signs of tuberculosis.

Treatment: Vaccinated with .2 cc. vaccine. No local reaction or temperature. This case illustrated the effect of a dose on a non-tuberculous showing the diagnostic value. Notwithstanding no reaction agglutins and precipitins increased.

Case No. 9. R. W., age 6.—Father tuberculous. Had been active, but was an apparent cure at this time. Tonsils and cervical glands enlarged. Anemic, listless, restless at night.

Treatment: Vaccinated with .2 cc. vaccine. Temperature 100°. Area slightly red and indurated. Temperature returned to normal in 48 hours and soreness left arm on fifth day. One month after vaccination cervical glands markedly diminished to size of small pea. Slept well, color improved. Left for home in the Middle West.

Case No. 10. Mrs. P. H. C.—Husband tuberculous, but at present an apparent cure. She showed no signs of tuberculosis. Treatment: Vaccinated with .3 cc. vaccine. Slight reaction, arm sore, temperature 99 2-5°. Temperature normal in three days.

Case No. 11. Baby C., 2 years old (daughter of above).—No signs of tuberculosis.

Treatment: Vaccinated with .1 cc. vaccine, slight reaction, slight sore arms, no rise in temperature.

Case No. 12. Miss S., age 26.—Slight cough attributed to cold, tires easily, loss of weight. Temperature 99° to 99 4-5° in afternoon and evening. Appetite poor, lost weight, sleep poor.

Examination: Changed breath sounds, upper right lobe.

Treatment: Vaccinated with .3 cc. vaccine. Reaction in 24 hours. Arm sore and red. Temperature 102° for 24 hours, when dropped to normal on second day and normal since. One month after cough gone, gained 4 lbs., slept good, tire gone, breath sounds improved.

Case No. 13. Miss D., age 25.—Active lesion found in the upper right side with moisture upon deep breathing and coughing. Tubercle bacilli found in the sputum, but she raised only a small quantity of sputum each morning. Temperature 100° to 100 2-5°. Cervical glands enlarged both anterior and posterior.

Treatment: Vaccinated with .3 cc. vaccine. Marked reaction within 12 hours. Temperature 102½°, backache and headache. Temperature fell to 99° within three days. Arm remained sore for 10 days. Temperature remained at 99° for almost a month, during which time she gained 22 lbs., felt fine, ate well, slept well. No expectoration, coughed slightly in the morning. Second dose of vaccine .4 cc. given at the end of 30 days. Slight reaction in both temperature and arm, which subsided at the end of 48 hours, with the temperature remaining at 99° for 20 days, after this injection, during which time this girl gained 6 more pounds. Exercise now allowed her each day, in the form of a walk, and a third injection at the end of 30 days from the second injection with .6 cc. vaccine. Breath sounds have entirely changed over the area involved, and no moist rales, but evidence of scar. The balance, 17 cases in all, are of no special interest from a clinical standpoint, excepting that they proved to be non-tuberculous, responding in no way to the injection of from .4 cc. to .2 cc. of the vaccine. In a number of these cases, I carried out the precipitin and agglutin tests and found these tests showed marked increase, following the injection.

I submit this simply as a preliminary report and hope at some future time to follow it with a list of cases treated by the vaccine.